



ENVIRONMENTAL ASSESSMENT
TO REPAIR THE AIRFIELD INFIELD
AT NELLIS AIR FORCE BASE,
NEVADA

October 1999

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DRAFT FINDING OF NO SIGNIFICANT IMPACT

1. Name of the Action:

The name of this action is Repair Airfield Infield at Nellis AFB, NV.

2. Description of Proposed Action and Alternatives

The proposed action would clear vegetation and grade the airfield infield. This action would repair drainage in the infield area. Additionally, a soil treatment, "Soil Sement", would be added to the soil to stabilize the soil to minimize dust from becoming airborne. Alternatives to the proposed action include; no-action; grading without stabilization; grading with application of "Polypavement" soil treatment; grading with over-excavation and recompaction; grading with caliche fill and application of "Soil Sement" soil treatment; and grading with partial application of "Soil Sement" soil treatment.

3. Summary of Environmental Impacts

The proposed action would have an adverse impact to air quality. Provisions of the Clark County Surface Disturbance Permit and associated Dust Mitigation Plan help minimize these impacts such that the proposed action falls within the State Implementation Plan for PM 10 dust. Biological resources would also be impacted, as all vegetation will be removed due to the proposed action. The area is segmented and been disturbed over the years and little natural native vegetation remains. Safety risks would reduce due to the proposed action. Using Operational Risk Management techniques, existing conditions at the airfield are high for obstruction hazards, foreign object damage hazards and Bird Aircraft Strike Hazards. Under the proposed action, obstruction hazards would reduce to moderate. Foreign object damage would remain high but to a lesser degree. Similarly, bird aircraft strike hazard would remain high but to a lesser degree. Stormwater drainage in the infield area would be improved due to the proposed action; flooding and erosion will be reduced. A Stormwater Permit and a Stormwater Pollution Prevention Plan will be required.

4. Conclusion

On the basis of the findings of the Environmental Assessment, no significant impact is anticipated for the proposed action on human health or the natural environment. A Finding of No Significant Impact is warranted and an Environmental Impact Statement is not required for this action.



ROBERT C. LYNN
Colonel, USAF
Vice Commander

28 OCT 99
Date

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1. PURPOSE OF AND NEED FOR ACTION

1.1. Proposed Action

The proposed action would be to grade the airfield infield and contour for effective drainage. Clearing and grubbing activities would also occur, as well as the removal of aircraft obstructions in the infield area.

1.2. Purpose and Need for Action

The purpose of the action is to provide a safer infield environment for aircraft at Nellis Air Force Base (NAFB). Currently, the infield area has obstructions, poor drainage and excess vegetation. Obstructions could damage aircraft which leave the runway surface, poor drainage hampers flying activities during heavy rains, and birds and other animals living in the vegetation have the potential for damaging aircraft.

The action is needed to comply with Air Force Instruction (AFI) 32-1013. This AFI contains specific guidance and regulations on the structure and maintenance of the infields and non-prepared surfaces surrounding runways and taxiways. The Air Warfare Center, Flight Safety Office estimates the Foreign Object Debris Damage and Bird Aircraft Strike Hazard will decrease by fifty percent.

1.3. Objectives of the Proposed Action

The objectives of this project are to eliminate hazards to aircraft by removing the obstructions, grading the infield, and clearing the vegetation in the process. This action would increase safety around the airfield.

1.4. Decision to be Made

The decision to be made by the Installation Commander is whether or not to allow the improvements to the airfield infield.

1.5. Scope of Analysis

An interdisciplinary team within 99 Air Base Wing/Environmental Management (99 ABW/EM) investigated all issues related to the proposed action such as air installation compatibility use zone, air quality, water quality, safety and occupational health, hazardous materials and hazardous waste, biological resources, cultural resources, and socioeconomic effects. Issues that were determined to have an environmental effect were air quality, safety and biological resources. Issues that were determined to be unaffected were hazardous materials/waste and cultural resources.

2. ALTERNATIVES INCLUDING THE PROPOSED ACTION

2.1. Description of Alternatives, Including the Proposed Action and No Action

The 99th Civil Engineering Squadron identified seven viable alternatives to achieve the objectives of reducing aircraft damage and to provide proper drainage. These alternatives are provided in Appendix A. The alternatives include no-action; grading without stabilization; grading with application of “Soil Sement” soil treatment, grading with application of “Polypavement” soil treatment, grading with over-excavation and recompaction, grading with caliche fill and application of “Soil Sement” soil treatment, and grading with partial application of “Soil Sement” soil treatment.

The alternatives analyzed in this document are the no-action alternative and grading using “Soil Sement” soil stabilization treatment. Grading without soil treatment, grading with over-excavation and recompaction, and partial application of “Soil Sement” are not analyzed because these alternatives would violate Clark County Air Pollution Control regulations. The regulations require soil treatment within thirty days of grading activities. “Polypavement” is a different formulization than “Soil Sement”, but it is designed for this type of use and the environmental impacts would not differ. Similarly, caliche fill with “Soil Sement” application would have the same impacts.

2.1.1. No Action

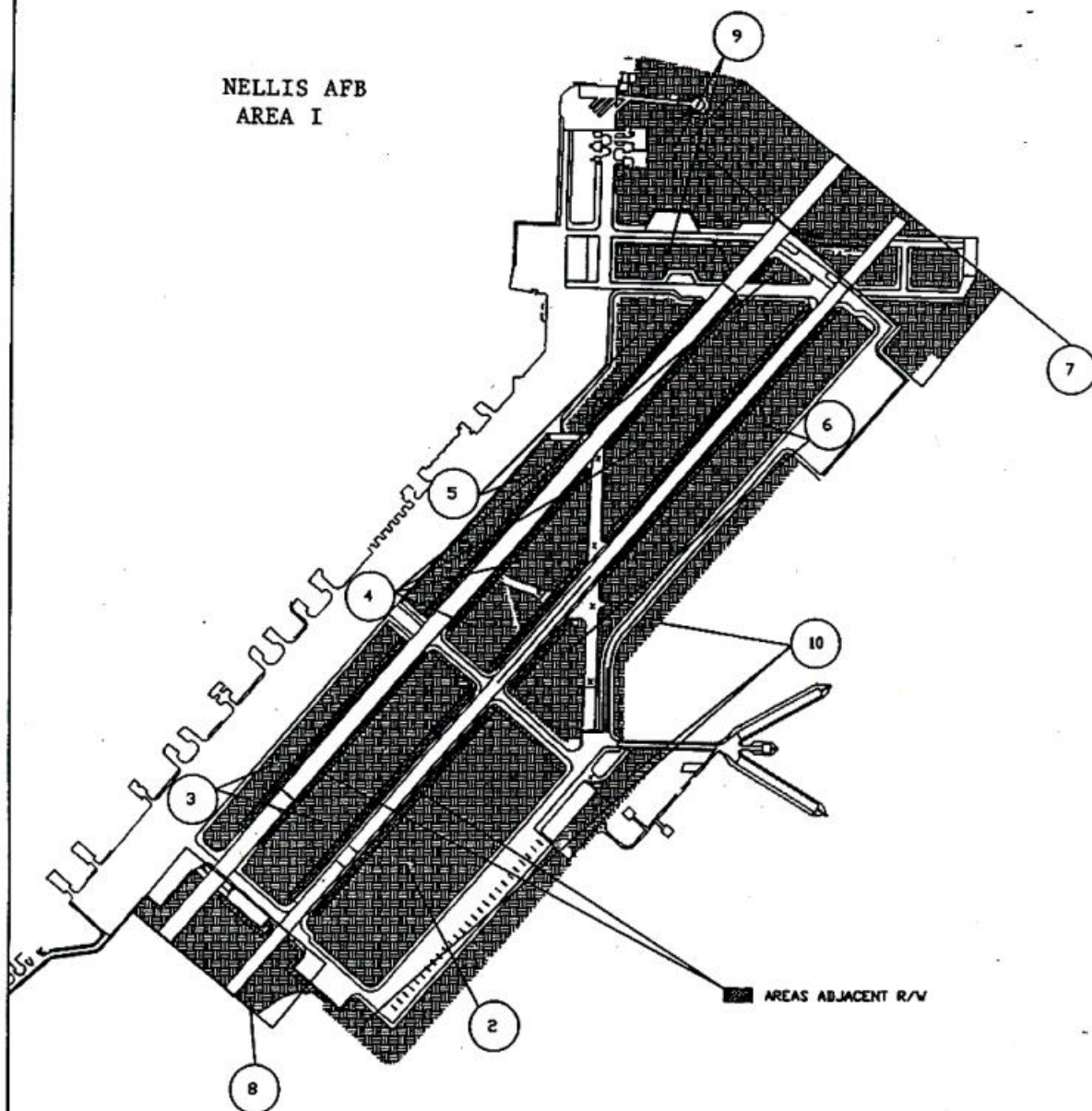
The no action alternative would maintain the infield at current levels. The current level of maintenance cuts vegetation in the immediate area of the runways and taxiways. The foreign object damage risk would not be reduced nor would obstructions be removed, thereby not reducing the hazard of aircraft that leave the paved areas. Bird Aircraft Strike Hazard (BASH) would also not be reduced.

2.1.2. Grading with Soil Stabilization

The proposed action alternative would be grading the surfaces around the infield as shown on Figure 2-1. Activities include clearing, rolling and adding a soil stabilization agent to the soil. A Dust Mitigation Plan would be required as part of the Surface Disturbance Permit. Provisions of the dust mitigation plan could include, but are not limited to the following: 1) soil stabilization must be applied within thirty days of the grading activities; 2) wetting the soil 24 hours prior to grading; 3) signage requirements; 4) gravel ingress/egress pad. County permits are issued on a yearly basis. Only the amount of grading that is funded for the current year would be applied to the permit.

The runways and taxiways provide borders to ten discrete areas of the infield. These areas include the area between the runways, along the taxiways, by the revetments, behind the hush-houses and at each end of the runways. Figure 2-1

NELLIS AFB
AREA I



AREAS FOR REPAIR (ACRES)

1	71.9
2	80.4
3	66.9
4	74.0
5	35.5
6	65.7
7	70.5
8	27.7
9	48.6
10	47.7
TOTAL 588.9	

SHEET NUMBER 1 OF 1	AIRFIELD INFIELD	DEPARTMENT OF THE AIR FORCE AIR COMBAT COMMAND NELLIS AFB, NEVADA CIVIL ENGINEER OFFICE	CEC																	
			AIR NICKET 05-18 VALLAPS 100 - 600 100-100 100-100																	

FIGURE 2-1
Airfield Infield Location

shows these areas. Funding and priorities determine which areas will be worked during the fiscal year. At this time, funding is not available to complete the entire project, so the areas with the greatest need will be addressed first. The areas between the runways and taxiways currently have the worst drainage problem and will likely be selected first. On the other hand, the areas by the hush-houses and the revetments are relatively flat and farther from the runways, so drainage and BASH issues are less in those areas. These areas would likely be graded last.

The sequence of operation for each area would be to clear and grub an area followed by grading and soil stabilization. The proposed soil stabilization agent for this action would be to use "Soil-Sement". The soil stabilization agent is non-toxic and designed for such an application.

Clearing and grading activities would be performed during the fall and winter months, which would not interfere with the breeding season of the burrowing owl.

2.1.3. Alternatives Considered but not Carried Forward

Alternatives to the proposed action would be to apply asphalt or concrete over the entire infield area. This alternative would meet the objectives of the proposed action, but would not be viable because of the high cost of installation.

2.1.4. Required Permits

A Clark County Surface Disturbance Permit and Dust Mitigation Plan are required for grading activities. A State of Nevada Stormwater Construction Permit along with a Stormwater Pollution Prevention Plan would be required.

3. AFFECTED ENVIRONMENT

3.1. Description of Project Area

Nellis Air Force Base is located at the northeast corner of the Las Vegas Valley in the southeastern corner of Nevada. The base is located adjacent to the cities of Las Vegas and North Las Vegas in Clark County. The unincorporated town of Sunrise Manor and uninhabited areas of Clark County encompass the majority of the base. The base covers 11,450 acres containing three major functional areas. Area I is the main base that includes the airfield and most of the mission support functions. The commissary, exchange and some housing are located in Area I. Area II is located east of Area I and houses the munitions area of the base. Area III lies across Las Vegas Blvd from Area I. Housing, the base hospital, and open space comprise most of Area III.

The project is located on Nellis AFB in Area I. A site map of the proposed action is shown on Figure 2-1. The proposed action would be located adjacent to the runways and taxiways.

3.2. Affected Resources

3.2.1. Air Installation Compatible Use Zone/Land Use (Noise, accident potential)

Nellis AFB is one of few military airfields located in Class B airspace. Class B airspace is established around the nation's busiest airports. High-density air traffic to and from both Nellis AFB and McCarran Airport warrants a Class B designation for the area. Aircraft entering into Class B airspace are required to be in communication and control of the air traffic control facility to maximize the safe, orderly flow of all aircraft operating in this congested area.

Two parallel runways (03/21) are orientated in a northeast-southwest direction. Normally, daytime arrivals and departures on a weekday, aircraft utilize Runway 21 towards the southwest. Aircraft turn left after departure to the north and northwest. However, local wind and weather conditions can warrant reversing the arrival/departure runways. At night the orientation is reversed to take-off and land towards the northeast. Aircraft carrying live ordnance always depart Runway 03 towards the northeast.

A summary of yearly NAFB airfield traffic counts since 1987 indicated that annual airfield operations have varied from 61,000 to 181,000 take-offs and landings.

3.2.2. Air Quality

Air quality in a given location is defined by the concentration of various pollutants in the atmosphere. The concentration of a pollutant is compared federal and state air quality standards. The National Ambient Air Quality Standards (NAAQS) are established by the U.S. Environmental Protection Agency (EPA) for the criteria pollutants: ozone (O₃), carbon monoxide (CO), nitrogen dioxide (NO₂), sulfur dioxide (SO₂), particulate matter less than 10 microns (PM₁₀), and lead (Pb).

The Clean Air Act of 1970 and Amendments of 1990 place most of the responsibility to achieve and maintain the NAAQS on individual states. The EPA assigns classifications to areas throughout the country with respect to air quality conditions. These classifications are respective of each criteria pollutant. A non-attainment is any area that does not meet the NAAQS. Former non-attainment areas, which have met the standards, are known as maintenance areas. Attainment areas meet the NAAQS for the pollutant. Unclassified or unclassifiable areas are those areas for which sufficient information is not available to determine whether the area meets or does not meet the standards.

The primary mechanism to achieve the NAAQS is through what is known as the State Implementation Plan (SIP). Each state is required to prepare a SIP for non-attainment and maintenance areas.

Nellis Air Force Base is in the Las Vegas metropolitan area, which is in the Clark County Air Quality Control Region. Las Vegas is designated as a serious non-

attainment area for both Carbon Monoxide (CO) and particulate matter less than 10 microns (PM10).

3.2.3. Water Resources

The Las Vegas Valley drains southeasterly into the Las Vegas Wash into Lake Mead. Nellis AFB is in the northeast portion of Las Vegas Valley within the Colorado River Basin. Natural surface waters and perennial streams are nonexistent because of low precipitation, high evaporation, and low humidity. No 100-year floodplains occur in the developed portions of Nellis AFB. Localized summer thunderstorms can be intense enough to occasionally cause flash flooding, but normally summer precipitation is lost to evaporation and transpiration. Seventy-five percent of the precipitation falls during the winter months. Precipitation not lost to evaporation is captured in shallow aquifers, the valley's principal basin-fill aquifer, and the Colorado River.

Carbonate rock aquifer systems underlie Nellis AFB. These aquifer systems are hydrologically connected to shallower alluvial aquifer systems composed of sand and gravel. 30-35,000 acre feet per year (AFY) recharge the principal aquifer in the Las Vegas hydrologic basin by the nearby Spring Mountains.

Nellis AFB uses water from surface and ground water sources. Surface water is pumped from Lake Mead and is administered and distributed by the Southern Nevada Water Authority's infrastructure. Ground water is pumped from 17 wells located on and off base. All water sources for Nellis AFB meet EPA and State of Nevada drinking water standards.

Current conditions of the airfield infield prevent effective drainage from the area. Periods of heavy rain fill up basins clogged with loose bush and the water backs up. Slopes in the infield are excessive and minor run-off causes erosion. Small gullies that run perpendicular (down gradient) to the runways are prevalent in the area.

3.2.4. Safety

This section addresses flight safety associated with activities conducted by units stationed at or operating from Nellis AFB. There are aggressive ground, munitions, and range safety programs also in place at NAFB and are briefly described below. This document will focus on flight safety. Flight safety considers aircraft flight risks such as aircraft accidents, obstruction hazards, foreign object debris (FOD) damage, and bird-aircraft strikes.

Ground and Range Safety covers day-to-day operations and maintenance activities conducted on Nellis Air Force Base and Range ensuring these operations are performed in accordance with applicable Air Force safety regulations, published Air Force Technical Orders, and standards prescribed by Air Force Occupational Safety and Health requirements.

Munitions safety assesses the management and use of ordnance or munitions associated with air base operations and training activities conducted at NAFR.

Although the primary public concern with regard to flight safety is the potential for airborne aircraft accidents, this document will address aircraft mishaps occurring on the ground. Airborne mishaps may occur as a result of mid-air collisions, collisions with manmade structures or terrain (obstructions), weather, mechanical failure, or pilot error. Flight risks apply to all aircraft; they are not limited to the military.

Aircraft flight operations from Nellis AFB are governed by flight standard rules. Specific procedures for the base are contained in standard operating procedures that must be followed by all aircrews operating from the installation (Air Force 1995). In the last five years, there has been only one aircraft accident on Nellis AFB, while over 325,000 airfield operations have been conducted.

The Air Force defines four categories of aircraft mishaps: Classes A, B, C, and High Accident Potential. Class A mishaps result in loss of life, permanent total disability, a total cost exceeding \$1 million, destruction of an aircraft, or damage to an aircraft beyond economical repair. Class B mishaps result in total costs between \$200,000 and \$1 million or result in permanent partial disability. Class C mishaps involve costs between \$10,000 and \$200,000 or loss of worker productivity for more than eight hours. High Accident Potential represents minor incidents not meeting any of the criteria for Class A, B, or C. This EA focuses on Class A mishaps because of the potential magnitude of their results. Class C mishaps and High Accident Potential are the most common occurrences involving minor damage and injuries and rarely affecting property or the public.

It is impossible to predict the precise location of an aircraft accident. Major considerations in an accident are loss of life and damage to property. The probability of an aircraft crashing into a populated area is extremely low, but it cannot be totally discounted. Several factors are relevant: 1) FAA regulations instruct pilots to avoid direct overflight of population centers at very low altitudes. 2) the limited amount of time the aircraft is over any specific geographic area limits the probability that impact of a disabled aircraft in a populated area would occur and 3) design and location of the clear zone and accident potential zones identify areas subject to higher risk from a crash.

Flight Safety considerations around the airfield infield are due to obstructions, FOD damage, and Bird Aircraft Strike Hazards (BASH). A risk assessment has been performed to assess the risk of safety hazards associated with the airfield. The methodology prescribed in Air Force Pamphlet 91-215 was used to determine the risk. For each type of hazard identified, the probability of an occurrence is analyzed to determine the frequency of the occurrence. Frequent, likely, occasional, seldom, and unlikely are the five probabilities associated with an

occurrence. Table 3-1 defines each probability. Also for each type of hazard, a severity of the occurrence is examined. The severity categories are catastrophic, critical, moderate, and negligible. The severity categories vary a little from the mishap categories and are defined in Table 3-2. Using the matrix shown in Figure 3-1, a risk is assigned to the hazard.

Table 3-1
Probability Definitions

Frequent	Continuously experienced
Likely	Occurs regularly
Occasional	Occurs several times in the life of the system
Seldom	Can be expected to occur in the life of the system
Unlikely	Unlikely but could occur in the life of the system

Table 3-2
Severity Definitions

Catastrophic	Complete mission failure or loss of system
Critical	Major mission degradation, or major system damage
Moderate	Minor mission degradation or minor system damage
Negligible	Less than minor mission degradation or minor system damage

Figure 3-1
Risk Assessment Matrix

			PROBABILITY				
			Frequent	Likely	Occasional	Seldom	Unlikely
S E V E R I T Y	Catastrophic	I	EXTREMELY HIGH				
	Critical	II		HIGH			
	Moderate	III		MODERATE			
	Negligible	IV		LOW			
			RISK				

OBSTRUCTIONS: The concern about low-lying obstructions around an airfield is when an aircraft departs the prepared surface of the runway or taxiway. “If an aircraft departs the prepared surface and impacts a tree, shrub or encounters an erratic surface with gullies/severe grades, the aircraft will likely cartwheel. This would result in catastrophic damage and severe/fatal injuries to the aircrew.” (AWFC/SEF 1998) An aircraft can depart the prepared surface by many reasons. Mechanical failure and blown tires are two reasons for departing the prepared surface. From 1987 to 1998, six aircraft departed the prepared surface

(AWFC/SE, 1998). The airfield is equipped with arresting cables, which help to prevent more aircraft from departing the prepared surface. In 1997, nine aircraft caught the arresting cables. "Based on the occasional occurrence of departure from the prepared surface (less than one per year) coupled with the reliability of the arresting gear, the overall risk of an aircraft sustaining damage as a result of the current condition of the airfield was downgraded from extremely high to high." (AWFC/SEF, 1998)

FOREIGN OBJECT DEBRIS DAMAGE: Foreign objects ingested by aircraft engines are the main concern of FOD. The impact from FOD ingestion can range from moderate to catastrophic (AWFC/SEF 1998). In the NAFB environment, tumbleweeds and brush pose the greatest hazard. Not only does the brush itself cause a hazard, but also when they blow across the runways, they can deposit rocks and dirt onto the surface. The base performs daily inspections prior to the start of aircraft operations to pick up FOD items, but rolling tumbleweeds can deposit objects throughout the day. F-16s are particularly vulnerable since they have a single engine and the intake is relatively low to the ground. From 1996 through 1998, fourteen occurrences of FOD damage occurred at a total cost of over \$80,000. The number of occurrences warrants an occasional probability. The risk level at NAFB for FOD damage is considered to be high.

BIRD-AIRCRAFT STRIKE HAZARDS: Bird-aircraft strikes constitute a safety concern because of the potential for damage to aircraft or injury to aircrews or local populations if an aircraft crashed in populated area. Over 95 percent of reported bird strikes occur below 3,000 feet AGL (above ground level). Approximately 50 percent of bird strikes happen in the airport or airfield environment, and 25 percent occur during low-altitude flight training (Worldwide Bird-Aircraft Strike Hazard Conference 1990).

For aircraft conducting airfield operations at or near Nellis AFB, the bird-aircraft strike data maintained by the base indicate that from 1994 through 1998, aircraft experienced 79 bird strikes at a total cost of \$591,676. In fiscal year 1998, four reported BASH incidents occurred during the take-off, landing, and taxi phase. Of these, an F-16 ingested an owl causing almost \$350,000 damage. AWFC/SEF assigned a probability of occasional for the occurrence of a bird strike. The severity is usually negligible, but a large bird can cause catastrophic damage, for this reason the severity is considered critical. The risk is therefore considered high.

3.2.5. Biological Resources

Biological resources incorporate living, native or naturalized plant and animal species and the habitats within which they occur. Plant associations are referred to as vegetation and animal species are referred to as wildlife. Habitat can be defined as the resources and conditions present in an area that produces occupancy of a plant or animal (Hall *et al* 1997). The analysis will focus on species or vegetation types that are important to the function of the ecosystem, are of special societal

importance, or are protected under federal or state law or statute. For purposes of the impact analysis, these resources will be divided into four major categories: (1) vegetation, (2) wetlands, (3) wildlife, and (4) threatened, endangered, or sensitive species. Those categories are described as follows:

- 1) Vegetation includes all existing terrestrial plant communities with the exception of wetlands or threatened, endangered, or sensitive species. Vegetation communities of interest include salt desert shrub, southern desert shrub, northern desert shrub, and pinyon-juniper.
- 2) Wetlands are considered sensitive and protected by Section 404 of the Clean Water Act. They include jurisdictional and non-jurisdictional wetlands. Jurisdictional wetlands consist of those that meet the three criteria defined in the *Corps of Engineers Wetlands Delineation Manual* (Army 1987) and are under the jurisdiction of the U.S. Army Corps of Engineers. Non-jurisdictional wetlands include wetlands meeting only one or two of the three criteria. Wetlands are generally associated with drainages, stream channels, and water discharge areas (natural and man-made).
- 3) Wildlife includes all vertebrate animals (i.e., fish, amphibians, reptiles, birds, and mammals) with the exception of those identified as threatened, endangered, or sensitive species. Invertebrate species or species groups such as mollusks (e.g., snail) or insects are sometimes included.
- 4) Threatened, endangered, or sensitive species are defined as those plant and animal species listed as threatened, endangered, or proposed as such, by the USFWS and/or Nevada Division of Wildlife (NDOW). Preservation of sensitive biological resources is accomplished through many means, most notably the Endangered Species Act, which protects federally listed threatened and endangered plant and animal species. Federal species of concern, formerly Category 2 candidate species, are not protected, by law; however, these species could become listed and, therefore, protected at any time. Considering these early in the planning process may avoid future conflicts that could otherwise develop. The State of Nevada also protects plant and animal species listed through the Nevada Revised Statutes and regulations set forth in the Nevada Administrative Code. Additionally, the Nevada Natural Heritage Program maintains a database of state species of concern, many of which are not afforded legal protection.

VEGETATION: Nellis AFB is located in the Mojave desertscrub biome, the smallest of the four North American warm-temperate desertland biomes. It is spatially and floristically intermediate between the Great Basin desertscrub and the Sonoran desertscrub. Winter rainfall predominates. The elevation range of the Mojave desertscrub biome is broader than that of the other desertscrub biomes, with roughly three-quarters of the biome lying between 2,000 and 4,000 feet. It is frequently referred to as “high desert” (Turner 1994b).

Most distinctions between desert biomes are based on the presence or absence of large, easily identified plant species. Main plant dominants of the Mojave desertscrub biome are creosote bush, all-scale, brittlebush, desert holly, and white burrobrush. Shadscale, blackbrush, yucca, and white bursage are also common (Turner 1994b).

The main base covers approximately 11,300 acres, 7,000 acres (62 percent) of which are undeveloped; the remaining area is either paved or contains structures. Native desertscrub vegetation is found in varying amounts in the developed and undeveloped areas of Nellis AFB, although native vegetation, when present has generally been greatly disturbed. One of the least disturbed areas of desertscrub vegetation is found in Area II, located in the northeastern portion of the base. The creosote bush-white bursage community (Air Force 1992c; Hazlett et al. 1997) dominates this area. The airfield infield is an area of the main base that is undeveloped but largely disturbed. Aerial photographs, dating 1943, 57, 84, and 90, show that nearly all of the area has been disturbed at some point in the past. The native and non-native vegetation existing in the infield is relatively sparse compared to other open areas around the base.

Approximately 1,000 acres of Nellis AFB are improved grounds, which are areas of turf grasses that require routine maintenance such as mowing, irrigating, and fertilizing. A wide variety of native and introduced, drought-tolerant deciduous trees and shrubs, evergreen trees and shrubs, perennials, ground covers, vines, and grasses have been planted throughout the base. They are contained mostly within and adjacent to developed areas at the base (Air Force 1997e).

WETLANDS: Recent field surveys have found that the only potential wetlands on Nellis AFB are the golf course ponds. U.S. Army Corps of Engineers personnel have determined that these man-made water sources are not subject to wetlands protection under the provisions of the Clean Water Act (Air Force 1997e). The remainder of the base is arid desert or urban development.

WILDLIFE: Due to its location adjacent to metropolitan Las Vegas and previous development and construction activities, Nellis AFB is primarily an urban environment with some relatively undisturbed lands lying to the east and north of the base. Wildlife species found on base are mostly limited to those that have adapted to high levels of human activity and disturbance.

THREATENED, ENDANGERED, OR SENSITIVE SPECIES: Only one sensitive plant species, the California or Las Vegas bearpoppy, is found on Nellis AFB. It is currently listed as a federal species of concern, critically endangered by the State of Nevada, and rare by the Nevada Natural Heritage Program. The USFWS considers protection of the Las Vegas bearpoppy as one of its highest priorities in Nevada. Species of concern are not protected under the Endangered Species Act; however, by protecting existing populations on public lands, including those found on Nellis

AFB, the USFWS seeks to avoid listing the Las Vegas bearpoppy as threatened (Air Force 1997e).

Four populations of Las Vegas bearpoppy have been located on Nellis AFB: three populations in Area II and one population in Area III. In 1996, Area II had approximately 1,300 plants and Area III had the largest population with “thousands of plants.” Because two of the four populations, including the Area III population, are exposed to habitat disturbance from human activities (e.g., motorcycling, bicycling, and horseback riding), current protective efforts are being evaluated by the Environmental Management office at Nellis AFB (Air Force 1997e). The Las Vegas Bearpoppy is not known to occur in Area I of the base, particularly in the infield area.

The chuckwalla and banded Gila monster are both federal species of concern; the State of Nevada also protects the Gila monster. At Nellis AFB, chuckwallas have been confirmed by the presence of scat on the rocky hillsides of the eastern portion of Area II (Air Force 1997e). Chuckwallas inhabit rocky hillsides, talus slopes, and rock outcrops in areas dominated by creosote. Rocks and their associated crevices provide shelter and basking sites.

The Gila monster is found in Mojave desertscrub habitat characteristic of the undeveloped areas of Nellis APR and the South Range. Gila monsters are capable of digging but they depend largely on natural crevices, desert woodrat nests, or animal burrows (e.g., those of the desert tortoise) for shelter. Winter ranges are generally in more elevated locations on rocky slopes or outcrops; summer ranges are located in adjacent lower valleys and bajadas. None of the typical habitats of the Chuckwalla or Gila Monster exists in the infield.

Bats are found in all major vegetation communities of Nevada (Hall 1946). Within these communities, bats inhabit a wide variety of habitats from rocky canyons to riparian washes. The low-elevation creosote bush-white bursage community, characteristic of the Mojave Desert and southern Nevada, appears to support the most bat species; the higher-elevation Great Basin sagebrush-pinyon-juniper community supports the fewest. Twenty species of bats potentially occur at Nellis AFB or on NAFR, twelve of which are considered species of concern by the USFWS. One species, the spotted bat is listed as threatened by the NDOW.

Only one Federal Bird Species of concern, the burrowing owl, has been found at Nellis AFB. Burrowing owls have been observed on and near Nellis AFB especially in the flat, previously disturbed areas found around the southern boundary of the base, including the concrete edges of flood control channels. They have been sighted along the south perimeter of Area I during construction activities adjacent to the golf course. In 1996, maintenance of a Clark County Regional Flood Control District channel within Area I disturbed two burrowing owls, and four artificial burrows were established in the southwest portion of Area I to comply

with USFWS recommended mitigation measures. Also in 1996, one adult and four young were seen in the southern corner of Area I, south of the golf course. Nearby construction was halted until the young fledged. The black tern and white-faced ibis may occur at the golf course ponds only as rare transient migrants. The phainopepla occurs at the Desert Wells Annex, 4 miles west of Nellis AFB. None of these three species have been observed at Nellis AFB (Air Force 1997e). The Burrowing Owl is known to occur in disturbed areas such as the airfield infield and, in fact, have been observed in the area.

3.2.6. Cultural Resources

Cultural resources are defined as any prehistoric or historic district, site, building, structure, or object considered to be important to a culture, subculture, or community for scientific, traditional, religious, or any other reason. Cultural resources are typically divided into three major categories: prehistoric and historic archaeological resources, architectural resources, and traditional cultural resources.

Prehistoric and historic archaeological resources are locations where human activity measurably altered the earth or left deposits of physical remains (e.g., arrowheads, bottles). To archaeologists, prehistoric archaeological resources predate written records. In southern Nevada these resources range from isolated stone tools to rockshelters and petroglyphs. Historic archaeological resources in Nevada include mines and associated debris, railroads, tails, and dumps. The distinction between prehistoric and historic might be somewhat arbitrary since American Indian groups, while performing traditional activities, may still create artifacts and features that archaeologists may unintentionally label as prehistoric.

Architectural resources are standing buildings, dams, canals, bridges, and other structures of historic or aesthetic significance. In Nevada, all architectural resources are historic in age.

Traditional cultural resources are resources associated with cultural practices and beliefs of a living community that are rooted in its history and are important in maintaining the continuing cultural identity of the community. In Nevada these resources are generally associated with modern American Indian groups. Traditional American Indian resources may include archaeological resources, locations of historic events, sacred areas, sources of raw material used to produce tools and sacred objects, traditional hunting or gathering areas, and native plants or animals. American Indians may consider these resources essential for the persistence of their traditional culture.

Under federal regulation, only significant cultural resources warrant consideration with regard to adverse impacts resulting from a federal undertaking. Significant archaeological, architectural, and traditional resources include those that are eligible or recommended as eligible for inclusion in the National Register of

Historic Places (NRHP). The significance of prehistoric and historic archaeological resources and architectural resources must be evaluated according to NRHP eligibility criteria (36 CFR 60.4), in consultation with the State Historic Preservation Officer (SHPO). According to these criteria, “significance” is present in districts, sites, buildings, structures, and objects that:

- a) Are associated with events that have made a significant contribution to the broad patterns of history;
- b) Are associated with the lives of persons significant in the past;
- c) Embody the distinctive characteristics of a type, period, or method of construction, represent the work of a master, possess high artistic value, or represent a significant and distinguishable entity whose components may lack individual distinction; or
- d) Have yielded or may be likely to yield information important in prehistory or history.

An archaeological or architectural resource that is eligible to the NRHP is called a historic property. To be listed on or determined eligible for listing on the NRHP, a cultural resource must meet at least one of the above criteria and must also possess integrity. Integrity is defined as the authenticity of a resource’s historic identity as evidenced by the survival of physical characteristics that existed during the historic or prehistoric occupation or use. The NRHP recognizes seven aspects or qualities that, in various combinations, define integrity: location, design, setting, materials, workmanship, feeling, and association. Integrity of location means that the cultural resource has not been moved. Integrity of design, materials, and workmanship means that the resource’s original building materials, plan, shape, and design elements remain intact. Integrity of setting means that the surrounding landscape remains largely as it was during the resource’s period of significance. Integrity of feeling and association means the resource retains a link to an earlier time and place and is able to evoke that era.

The determination of significance is made in consultation with the SHPO. Significant historic resources usually must be at least 50 years old; however, certain structures associated with more recent, exceptionally important historical events (e.g., the Cold War) also may be considered eligible for the NRHP. Archaeological isolates, because of their small size and limited information potential, are not considered eligible for the NRHP by the Nevada SHPO.

Certain categories of tangible American Indian resources, such as ancestral settlements or petroglyph and pictograph sites, may be protected through their eligibility to the NRHP. On the other hand, natural features and spiritual locations may not be addressed in historic preservation legislation if their historic use cannot be documented, if the resource does not have an integral relationship to traditional

cultural practices and beliefs, if the present condition is such that the relationships no longer survive, if the resource's boundaries cannot be delineated, or if the resource does not meet NRHP criteria.

Even though a cultural resource may not be considered significant according to NRHP criteria, it may still have importance as a traditional resource to a particular tribe. In this case, traditional resources may be protected according to the consultation provisions of the Native American Graves and Repatriation Act if it contains a human burial or the American Indian Religious Freedom Act and Executive Order 13007, Indian Sacred Sites if it is important in religious rituals.

A single traditional resource may also be significant for more than one reason. For example, an outcrop of an unusual type of chert may be important to a tribe as a source of raw material for making tools, a source of medicine, a spiritual location, a link to the groups ethnic identity, a location to teach children about traditional beliefs and practices, and as a former living site.

ARCHAEOLOGICAL RESOURCES: As of 1997, more than 6,937 acres on Nellis AFB had surveyed for cultural resources. These surveys included 100 percent of Area I, 66 percent of Area II, and 30 percent of Area III. No National Register of Historic Places (NRHP) eligible sites was found in Areas I and III. Sixty-six archaeological sites have been recorded in Area II, 22 of these are considered to be eligible to the NRHP. Of the 22 sites, six are prehistoric and 16 are historic in two historic districts, the Arrowhead Trail District and the Midnight/Moonlight Historic Mining District.

ARCHITECTURAL RESOURCES: An inventory and evaluation of ten World War II (WWII) structures have been completed on Nellis AFB and Indian Springs Air Force Auxiliary Field. The only WWII structure evaluated as potentially eligible for nomination to the NRHP is the original McCarran Field Air Terminal (now Base Ops) but was not nominated. Nevada State Historic Preservation Office asked that Nellis reconsider nomination; however recent evaluations indicate the building does not meet the integrity criteria because of modifications to the building throughout its existence. SHPO has agreed with this determination.

TRADITIONAL: RESOURCES: No known traditional resources, sacred areas, or traditional use areas have been identified on Nellis AFB. Nellis is currently working with American Indian groups through the Native American Interaction Program (NAIP) to identify these resources.

4. Environmental Consequences.

4.1. No Action Alternative

4.1.1. Air Installation Compatible Use Zone/Land Use (Noise, accident potential).

The No Action alternative would not alter existing conditions at NFB.

4.1.2. Air Quality

Air Quality under the No-Action Alternative would remain as is.

4.1.3. Water Resources

Storm-water run-off would continue to be a problem at the NAFB infield under the No-Action Alternative. Drainage problems would persist and eventually erode areas near culverts and the edges of the runways. Deteriorating conditions would continue to retard run-off and cause erosion.

4.1.4. Safety

Under the No-Action Alternative, existing hazards from foreign object damage, bird aircraft strike hazard, and airfield obstructions would remain. The risks associated with obstructions, FOD and BASH would remain high for each hazard.

4.1.5. Biological Resources

Existing conditions of biological resources would remain the same under the No-Action Alternative.

4.1.6. Cultural Resources

There would be no impact to cultural resources under the No-Action Alternative.

4.2. Proposed Action

4.2.1. Air Installation Compatible Use Zone/Land Use (Noise, accident potential)

The proposed action would occur in the infield areas where the highest aircraft noise levels occur. The proposed action would create construction noise but would be overshadowed by aircraft noise and be short-term only when construction activities occur.

The land use of the airfield infield is designated as open space for safety reasons. The proposed action would improve the land use by removing obstructions and vegetation and is consistent with the designated land use.

4.2.2. Air Quality

A Clark County Area Surface Disturbance Permit (Section 17) for fugitive dust is required. Other than fugitive dust during construction, there would be no long-term air quality impact due to this project. A conformity determination would not be

necessary since the proposed action would be accomplished according to the State Implementation Plan.

If grading 589 acres would occur in a single year, it would theoretically exceed *deminimus* levels. As stated previously, funding and priorities would preclude the action would be performed in one year. Furthermore, the dust permit requires a dust mitigation plan, which will be prepared by the prime contractor and approved by Clark County Health District, Air Pollution Control Board. According to the Air Pollution Control Board, this plan would be implemented in accordance with the State Implementation Plan, therefore a Conformity Analysis would not be required (personal communication, Cindy Mikes, 1999). The dust mitigation plan must state the positive measures to control dust. Provisions of the dust mitigation plan could include, but are not limited to the following: 1) soil stabilization must be applied within thirty days of the grading activities; 2) wetting the soil 24 hours prior to grading; 3) signage requirements; 4) gravel ingress/egress pad.

Overall, the grading activities would produce a short-term impact to air quality. In the long-term, however, the soil stabilization would eliminate some of the air borne dust generated from the infield area.

4.2.3. Water Resources

There would be impact to water quality due to this project. The only issue regarding water is stormwater. By design, the proposed action would increase storm-water run-off. The design would be such that storm-water drains efficiently into the existing storm-water channels. Furthermore, recent improvements to the storm channel near the golf course would be adequate to accommodate additional storm-water run-off. The proposed action would require a storm-water discharge permit.

4.2.4. Safety

The proposed action would benefit air safety by the removal of obstructions and easing of potential FOD and BASH problems. The proposed action would reduce the risk around the airfield.

Removing the obstructions would not reduce the probability of an aircraft departing the prepared surface. But, it would reduce the probability of the aircraft departing the prepared surface AND impacting a tree, shrub or encountering an erratic surface with gullies/severe grades that could induce a cartwheel. The Risk Assessment (AWFC/SEF 1998) shows that only occasionally does an aircraft depart the prepared surface. But the assessment determined the probability of impacting an obstruction once departed from the surface is likely. The proposed action would remove all of the vegetation and most of the obstructions. This would reduce the probability from likely to occasional or seldom. Coupled with the occasional probability of leaving the surface would reduce the overall probability to seldom. The severity would range from negligible to catastrophic if an aircraft departs the prepared surface even after the infield improvements. However, less

obstructions which aircraft may strike would make the severity considered critical. Therefore, the risk would be reduced to medium risk. During construction, activities would not effect the potential for obstruction hazards.

FOD damage due to vegetation blown across the runway would reduce, however the other sources of FOD such as rocks, nuts and bolts would not decrease. Overall the probability would remain as occasional. The Severity would not change from critical. The risk would remain at high, but to a lesser degree. However, grading activities while performing the proposed action could kick up rocks and dust and would also uproot all of the plants. This would produce a short-term increase in FOD damage potential, but would only change the probability from occasional to likely. This would still fall into the high-risk category.

Bird strikes by aircraft could reduce due to the proposed action once all of the vegetation is removed. The probability of a bird strike would remain as occasional, since there are no proposals to eliminate birds from transiting across the infield area. The severity would remain as critical. Therefore the risk would remain in the high category. In fact, the bird strike probability could increase during the construction activities and short-term following he activities because as the habitat is reduced, the concentration of rodents would increase in the remaining habitats. The removal of vegetation also removes hiding places for the rodents. As a result, more raptors may congregate to feed on the rodents. Even still, the probability would remain occasional; therefore the risk would still be considered high.

4.2.5. Biological Resources

Aerial photographs dating from 1943 to 1990 shows that over the years much of the project area has been disturbed. Rough estimates indicate that maybe less than five percent has not been disturbed. The undisturbed portions are fragmented and adjacent to developed areas and are not supportive of sustaining any significant populations of vegetation and/or wildlife.

VEGETATION: The proposed action would eliminate all remaining vegetation in the infield area. Heavy disturbance other the years has eliminated the entire natural habitat in the project area. Although native vegetation would be removed, so would non-native vegetation. Non-native vegetation, such as Russian Thistle and Tamarisk, are considered invasive and noxious to Nevada. Removing the non-native vegetation would be a beneficial impact.

The base biologist estimates that the biological productivity of the infield area is very low compared to undisturbed areas away from the infield.

WETLANDS: There are no wetlands or floodplains in the proposed work area.

WILDLIFE: The lack of natural habitat precludes the existence of wildlife that does not readily adapt to disturbed areas. Wildlife observed in the infield area consists of small rodents, rabbits, songbirds, and an occasional coyote. The proposed action would eliminate the non-natural habitat for this wildlife, but most would move to adjacent areas.

THREATENED, ENDANGERED, OR SENSITIVE SPECIES: Las Vegas Bearpoppy habitat is gypsum soils that do not exist in the infield area. Therefore, there would be no impact to the Las Vegas Bearpoppy. The proposed action would occur during the fall and winter months when Burrowing Owls are not mating or brooding. It is expected that the owls will relocate once the commotion of construction activity starts.

4.2.6. Cultural Resources

The base archeologist reviewed the proposed action and determined there are no archeological sites on or near the proposed action. The State Historical Preservation Office has been notified of the proposed action to fulfill obligations under section 106 of the National Historic Preservation Act via letter dated 21 June 1996.

5. APPENDICES

- A. Executive Summary Report – Economic Analysis**
- B. Air Force Form 813**
- C. Photographs of Airfield Obstructions**
- D. Operational Risk Management Assessment of Flight Operations at NAFB**

APPENDIX A

Executive Summary Report – Economic Analysis

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Repair Airfield Infield Soil Stabilization
ECONOMIC ANALYSIS

EXECUTIVE SUMMARY REPORT

PROJECT TITLE : Repair Airfield Infield
DISCOUNT RATE : 5.9%
PERIOD OF ANALYSIS: 15 Years
START YEAR : 1999
BASE YEAR : 1999
REPORT OUTPUT : Current Dollars

PROJECT OBJECTIVE : Control aircraft damage resulting from dust, FOD, soil erosion, and Bird Strikes.

ALTERNATIVES CONSIDERED FOR THIS ANALYSIS:

VIABLE ALTERNATIVES:

The following alternatives were considered as viable alternatives in this economic analysis:

1. Status Quo:

Maintain the existing condition of the infield. This alternative WILL NOT correct the FOD and Bird Strike damage problems currently encounter at the airfield. It requires no initial construction cost and maintenance costs are included only to address overgrown vegetation directly adjacent to the runways. FOD and Bird Strike damage is excessive now and can be expected to accelerate as erosion and vegetation growth continues on the infield. The increased risk of aircraft damage and crew injury can have a significant impact the Nellis AFB Mission.

2. Grading without Stabilization:

This alternative provides for grading the existing infield without special surface treatment of the soil. It includes clearing, rolling and applying herbicide to the infield area, as well as grading the area to improve drainage and erosion control. Even though drainage is improved under this alternative, without surface treatment the infield is subject to periodic storm water damage, dust and FOD problems. In addition, diligent maintenance is required to prevent recurring vegetation growth and surface erosion.

3. Grading with Application of "Soil-Sement" soil treatment:

This alternative provides for grading the existing infield and providing a surface treatment to stabilize the soil. It includes clearing, rolling and applying herbicide to the infield area, as well as grading and applying a soil stabilization agent ("Soil-Sement") for erosion and FOD control. Some requirements for localized repair of storm water erosion should be expected and selective reapplication of the soil treatment is necessary after four years.

4. Grading with Application of "Polypavement" soil treatment:

This alternative provides for grading the existing infield and providing a surface treatment to stabilize the soil. It includes clearing and rolling the infield area, as well as grading and applying a soil stabilization agent

("Polypavement") for erosion and FOD control. Some requirements for localized repair of storm water erosion should be expected and selective reapplication of the soil treatment is necessary after ten years. This soil treatment does not require herbicide prior to application for control of vegetation.

5. Grading with Over-Excavation and Recomaction:

This alternative provides for over-excavation of the existing infield and recompacting the soil without application of supplemental soil stabilization treatment. It includes clearing, excavation of an average of approximately three inches of soil, and recompacting the soil to the required grades. Applying a herbicide is included, as well as grading the area to improve drainage and erosion control. Even though drainage is improved under this alternative, without surface treatment the infield is subject to periodic storm water damage. In addition, diligent maintenance is required to prevent recurring vegetation growth and surface erosion. The average depth of over-excavation is assumed at three inches; however, the actual depth required may be greater depending on the results of geotechnical soil tests.

6. Grading with Caliche Fill and Application of "Soil-Sement" soil treatment:

This alternative provides for grading the existing infield and providing approximately three inches of caliche fill over the entire infield area with a surface treatment to stabilize the soil. It includes clearing, rolling and applying herbicide to the infield area, as well as grading with approximately three inches of caliche fill and application of a soil stabilization agent ("Soil-Sement") for erosion and FOD control. Some requirements for localized repair of storm water erosion should be expected and selective reapplication of the soil treatment is necessary after four years; however the erosion repair required is less than that anticipated for other alternatives.

7. Grading with Partial Application of "Soil-Sement" soil treatment:

This alternative provides for grading the entire existing infield and providing a surface treatment to stabilize the soil for 100 feet on either side of both runways. It includes clearing, rolling and applying herbicide to the entire infield area, as well as grading and partial application of a soil stabilization agent ("Soil-Sement") for erosion and FOD control. Some requirements for localized repair of storm water erosion should be expected and selective reapplication of the soil treatment over the partial area is necessary after four years.

ADDITIONAL ALTERNATIVES CONSIDERED:

The following additional alternatives were considered but rejected as infeasible or not able to provide the required facilities, and thus were not included in the economic analysis:

1. Concrete or Asphalt Paving:

This alternative would apply asphalt or concrete paving over the infield area. While this alternative will meet the requirements for control of dust, FOD and Bird Impact, it is clearly not a viable alternative because of the high initial cost for the paving.

ASSUMPTIONS OF THE ANALYSIS:

This economic analysis is based on the following factors and assumptions:

1. All costs occur throughout the year and will be discounted using the "middle-of-year" convention.
2. Beneficial Occupancy (Use) Date will be 1999 for each alternative.
3. Per Appendix C, dated 10 Feb 94, of OMB Circular A-94, a discount rate of 5.9% is used for a 15 year analysis period.
4. Depreciation associated with land costs will be the same for all alternatives and, as such, is not included in the analysis.
5. Physical life of the airfield facility is considered ongoing (in excess of 40 years). An analysis period of 15 years is used for all alternatives to include requirements for retreatment and surface maintenance.
6. Maintenance and repair costs for soil stabilization systems are based on manufacturers' material cost data and representative application costs for the Nellis AFB area.
7. Costs for aircraft damage due to bird strikes and FOD incidents are based on the report prepared by Nellis AFB on Operational Risk Management Assessment of Flight Operations at Nellis Airfield, dated 7 October 1998.
8. Insurance, land, and real estate taxes are equal for each alternative and are not separately analyzed. No additional land acquisition is required for any of the alternatives considered.

ECONOMIC INDICATORS:

ALTERNATIVE NAME	NPV
1 Status Quo	\$8,744,504
2 Grading w/o Stabilization	\$8,734,607
3 Soil-Sement Treatment	\$7,971,176
4 Polypavement Treatment	\$10,147,293
5 Excavation/Recompaction	\$9,168,672
6 Caliche Stabilization	\$9,398,498
7 Partial Soil-Sement Treatment	\$7,845,761

NON-MONETARY COSTS AND BENEFITS:

Non-monetary costs and benefits include:

1. Improved control of dust, FOD, and Bird Strikes will improve Mission Readiness by reducing the potential for aircraft damage and personnel injury associated with the airfield operations.
2. The appearance of the Airfield will be improved.
3. Reduced requirements for airfield infield maintenance will allow maintenance personnel to be available for other maintenance activities.

RESULTS AND RECOMMENDATIONS:

EXECUTIVE SUMMARY

Costs and benefits for alternative methods for control of FOD and Bird Strikes at the Nellis AFB Airfield were analyzed over a 15-year period. Estimated costs

were discounted at a 5.9 percent rate, and then totalled to arrive at a net present value (NPV) for each alternative. The least-cost alternative is Alt-7 (Grading with Partial Application of "Soil-Sement" soil treatment) with a NPV of \$7.85M. The NPV for each Alternatives considered is as follows:

Alternative Description	NPV
1. Status Quo:	\$ 8.74M
2. Grading without Stabilization:	\$ 8.73M
3. Grading with Application of "Soil-Sement" Soil Treatment:	\$ 7.97M
4. Grading with Application of "Polypavement" soil Treatment:	\$10.15M
5. Grading with Over-excavation and Recompaction:	\$ 9.17M
6. Grading with Caliche Fill & "Soil-Sement" Soil Treatment:	\$ 9.40M
7. Grading with Partial Application of "Soil-Sement" Soil Treatment: .	\$ 7.85M

Alt-3 (\$7.97M), the next lowest life cycle cost alternative, is approximately \$0.12M more NPV than Alt-7. Thus, the government would need \$0.12M more (in present value terms, invested at 5.9 percent) to finance Alt-3.

The initial construction costs for each alternative is as follows:

Alternative Description	Cost
1. Status Quo:	\$ 0.00M
2. Grading without Stabilization:	\$ 1.85M
3. Grading with Application of "Soil-Sement" Soil Treatment:	\$ 3.43M
4. Grading with Application of "Polypavement" soil Treatment:	\$ 7.40M
5. Grading with Over-excavation and Recompaction:	\$ 3.05M
6. Grading with Caliche Fill & "Soil-Sement" Soil Treatment:	\$ 6.15M
7. Grading with Partial Application of "Soil-Sement" Soil Treatment: .	\$ 2.10M

Based on the NPV results, the least-cost alternative is Alt-7, Grading with Partial Application of "Soil-Sement" Soil Treatment. Construction costs are estimated at approximately 40% above the available construction funds identified in the project scope of work. In addition, the soil stabilization treatment is only applied to 100 feet on either side of each of the two runways.

Alt-3, Alt-4, and Alt-6 each provide complete soil stabilization coverage of the airfield infield; and therefore, provide more control of FOD and Bird Strikes. The construction cost for each of these alternatives exceeds the available funds indicated in the project scope of work.

ACTION OFFICER: Brenda Wendling, 99 CONS/LGCC, (702) 652-9336
 ORGANIZATION : Nellis Air Force Base

LIFE CYCLE COST REPORT

SOURCE AND DERIVATION OF COSTS AND BENEFITS:

The costs for each alternative is derived as follows:

1. STATUS QUO:

a. Initial Construction. There is no initial construction cost for this alternative.

b. Maintenance. (Includes work required on a yearly basis.)

Personnel: 6 People x \$35/hr x 40hr/wk x 6 weeks = \$50,400/yr
Equipment: Vehicles and equipment = \$ 4,000/yr

\$54,400/yr

c. Periodic Repair. (Includes repair costs for retreatment, if applicable, and storm damage.) NOT APPLICABLE

d. Aircraft Damage.

Damage to aircraft in 1998 was \$575,000. (This figure has significantly increased over the last five years as the condition of the infield deteriorates. A rate of increase at 2.5 times the normal inflation rate is used for the purposes of this analysis.)

Source: Estimate based on Operational Risk Management Assessment of Flight Operations at Nellis Airfield, October 1998.

2. GRADING WITHOUT STABILIZATION:

a. Initial Construction Cost. This estimate is based on a preliminary engineering estimate. Costs are adjusted for FY-99 costs.

Clearing: 750 acre x \$150/acre = \$ 112,500
Grading: 750 acre x \$1,500/acre = \$1,125,000
Rolling: 750 acre x \$420/acre = \$ 315,000
Herbicide: 750 acre x \$400/acre = \$ 300,000

\$1,852,500

b. Maintenance. (Includes work required on a yearly basis.)

Personnel: 3 People x \$35/hr x 40hr/wk x 6 weeks = \$25,200/yr
Equipment: Vehicles and equipment = \$ 4,000/yr

\$29,200/yr

c. Periodic Repair. (Includes repair costs for retreatment, if applicable, and storm damage.)

Retreatment of herbicide (1 per 5 years): \$300,000/5yr = \$ 60,000/yr
Grading Repair and Compaction: \$1,125,000 x 10% = \$112,500/yr

\$172,500/yr

d. Aircraft Damage.

Damage to aircraft in 1998 was \$575,000. Operational Risk Management estimates a 50% reduction in aircraft damage with infield repairs and

soil stabilization treatment. A 40% reduction is used for this analysis for infield repairs without soil stabilization.

$$\$575,000 \times (1.00 - 0.40) = \$345,000/\text{yr}$$

The increase in this cost is taken at a rate roughly equivalent to the inflation rate since the control of FOD and Bird Strikes will be maintained with the infield repair.

3. GRADING WITH APPLICATION OF "SOIL-SEMENT" SOIL TREATMENT:

a. Initial Construction Cost. This estimate is based on a preliminary engineering estimate. Costs are adjusted for FY-99 costs.

Clearing:	750 acre x \$150/acre =	\$ 112,500
Grading:	750 acre x \$1,500/acre =	\$1,125,000
Rolling:	750 acre x \$420/acre =	\$ 315,000
Herbicide:	750 acre x \$400/acre =	\$ 300,000
"Soil-Sement"	750 acre x \$2,100/acre =	\$1,575,000

\$3,427,500

b. Maintenance. (Includes work required on a yearly basis.)

Personnel: 3 People x \$35/hr x 40hr/wk x 4 weeks = \$16,800/yr

Equipment: Vehicles and equipment = \$ 2,000/yr

\$18,800/yr

c. Periodic Repair. (Includes repair costs for retreatment, if applicable, and storm damage.)

Retreatment "Soil-Sement" (2.5%/yr): \$1,575,000 x .025 = \$ 39,375/yr

Grading Repair and Rolling: \$1,125,000 x 5% = \$ 56,250/yr

\$ 95,625/yr

d. Aircraft Damage.

Damage to aircraft in 1998 was \$575,000. Operational Risk Management estimates a 50% reduction in aircraft damage with infield repairs and soil stabilization treatment.

$$\$575,000 \times (1.00 - 0.50) = \$287,500/\text{yr}$$

The increase in this cost is taken at a rate roughly equivalent to the inflation rate since the control of FOD and Bird Strikes will be maintained with the infield repair.

4. GRADING WITH APPLICATION OF "POLYPAVEMENT" SOIL TREATMENT:

a. Initial Construction Cost. This estimate is based on a preliminary engineering estimate. Costs are adjusted for FY-99 costs.

Clearing:	750 acre x \$150/acre =	\$ 112,500
Grading:	750 acre x \$1,500/acre =	\$1,125,000
Rolling:	750 acre x \$420/acre =	\$ 315,000
Herbicide:	750 acre x \$0/acre =	\$ 0
"Polypavement"	750 acre x \$7,800/acre =	\$5,850,000

\$7,402,500

b. Maintenance. (Includes work required on a yearly basis.)

Personnel: 3 People x \$35/hr x 40hr/wk x 2 weeks = \$ 8,400/yr
Equipment: Vehicles and equipment = \$ 2,000/yr

\$ 7,600/yr

c. Periodic Repair. (Includes repair costs for retreatment, if applicable, and storm damage.)

Retreatment "Polypavement" (33.3% / 10yr intervals):

\$5,850,000 x .333 = \$1,950,000/10yr

Grading Repair and Rolling: (10.0% / 10yr intervals)

\$1,440,000 x .10 = \$ 144,000/10yr

\$2,094,000/10yr

d. Aircraft Damage.

Damage to aircraft in 1998 was \$575,000. Operational Risk Management estimates a 50% reduction in aircraft damage with infield repairs and nominal soil stabilization treatment. A 70% reduction is used for this analysis for infield repairs with high quality soil stabilization.

$\$575,000 \times (1.00 - 0.70) = \$172,500/\text{yr}$

The increase in this cost is taken at a rate roughly equivalent to the inflation rate since the control of FOD and Bird Strikes will be maintained with the infield repair.

5. GRADING WITH OVER-EXCAVATION & RECOMPACTION WITHOUT STABILIZATION:

a. Initial Construction Cost. This estimate is based on a preliminary engineering estimate. Costs are adjusted for FY-99 costs.

Clearing:	750 acre x \$150/acre =	\$ 112,500
Grading & Excavation:	750 acre x \$2,900/acre =	\$2,175,000
Recompaction:	750 acre x \$620/acre =	\$ 465,000
Herbicide:	750 acre x \$400/acre =	\$ 300,000
Soil Stabilizer:	Not Applicable =	\$ 0

\$3,052,500

b. Maintenance. (Includes work required on a yearly basis.)

Personnel: 3 People x \$35/hr x 40hr/wk x 4 weeks = \$16,800/yr
Equipment: Vehicles and equipment = \$ 4,000/yr

\$20,800/yr

c. Periodic Repair. (Includes repair costs for retreatment, if applicable, and storm damage.)

Retreatment of herbicide (1 per 5 years): \$300,000/5yr = \$ 60,000/yr
Grading Repair and Compaction: \$1,125,000 x 8% = \$ 90,000/yr

\$150,000/yr

d. Aircraft Damage.

Damage to aircraft in 1998 was \$575,000. Operational Risk Management estimates a 50% reduction in aircraft damage with infield repairs and soil stabilization treatment. A 40% reduction is used for this analysis for infield repairs without soil stabilization.

$$\$575,000 \times (1.00 - 0.40) = \$345,000/\text{yr}$$

The increase in this cost is taken at a rate roughly equivalent to the inflation rate since the control of FOD and Bird Strikes will be maintained with the infield repair.

6. GRADING WITH CALICHE FILL & APPLICATION OF "SOIL-SEMENT" SOIL TREATMENT:

a. Initial Construction Cost. This estimate is based on a preliminary engineering estimate. Costs are adjusted for FY-99 costs.

Clearing:	750 acre x \$150/acre =	\$ 112,500
Grading & Excavation:	750 acre x \$1,800/acre =	\$1,350,000
Compaction:	750 acre x \$620/acre =	\$ 465,000
Additional Hauling:	1 LS =	\$ 300,000
Caliche Fill:	750 acre x \$2,600/acre =	\$1,950,000
Herbicide:	750 acre x \$400/acre =	\$ 400,000
"Soil-Sement":	750 acre x \$2,100/acre =	\$1,575,000
		<hr/>
		\$6,152,500

b. Maintenance. (Includes work required on a yearly basis.)

Personnel:	3 People x \$35/hr x 40hr/wk x 2 weeks =	\$ 8,400/yr
Equipment:	Vehicles and equipment =	\$ 2,000/yr
		<hr/>
		\$ 7,600/yr

c. Periodic Repair. (Includes repair costs for retreatment, if applicable, and storm damage.)

Retreatment "Soil-Sement" (2.50%/yr):	\$1,575,000 x .025 =	\$ 39,375/yr
Grading Repair and Compaction (2.5%/yr):	\$1,815,000 x .025 =	\$ 45,375/yr
		<hr/>
		\$ 84,750/yr

d. Aircraft Damage.

Damage to aircraft in 1998 was \$575,000. Operational Risk Management estimates a 50% reduction in aircraft damage with infield repairs and nominal soil stabilization treatment. A 65% reduction is used for this analysis for infield repairs with high quality soil stabilization.

$$\$575,000 \times (1.00 - 0.65) = \$201,250/\text{yr}$$

The increase in this cost is taken at a rate roughly equivalent to the inflation rate since the control of FOD and Bird Strikes will be maintained with the infield repair.

7. GRADING WITH PARTIAL APPLICATION OF "SOIL-SEMENT" SOIL TREATMENT:

a. Initial Construction Cost. This estimate is based on a preliminary engineering estimate. Costs are adjusted for FY-99 costs.

Clearing:	750 acre x \$150/acre =	\$ 112,500
-----------	-------------------------	------------

Grading:	750 acre x \$1,500/acre =	\$1,125,000
Rolling:	750 acre x \$420/acre =	\$ 315,000
Herbicide:	750 acre x \$400/acre =	\$ 300,000
"Soil-Sement"	120 acre x \$2,100/acre =	\$ 252,000
		<u>\$2,104,500</u>

b. Maintenance. (Includes work required on a yearly basis.)

Personnel:	6 People x \$35/hr x 40hr/wk x 6 weeks =	\$50,400/yr
Equipment:	Vehicles and equipment =	\$ 4,000/yr
		<u>\$54,400/yr</u>

c. Periodic Repair. (Includes repair costs for retreatment, if applicable, and storm damage.)

Retreatment "Soil-Sement" (10.0%/yr):	\$252,000 x .10 =	\$ 25,200/yr
Grading Repair and Rolling:	\$1,125,000 x 4.5% =	\$ 50,625/yr
		<u>\$ 75,825/yr</u>

d. Aircraft Damage.

Damage to aircraft in 1998 was \$575,000. Operational Risk Management estimates a 50% reduction in aircraft damage with infield repairs and soil stabilization treatment.

Damage to aircraft in 1998 was \$575,000. Operational Risk Management estimates a 50% reduction in aircraft damage with infield repairs and nominal soil stabilization treatment. A 45% reduction is used for this analysis for infield repairs with partial soil stabilization.

$\$575,000 \times (1.00 - 0.45) = \$373,750/\text{yr}$

The increase in this cost is taken at a rate roughly equivalent to the inflation rate since the control of FOD and Bird Strikes will be maintained with the infield repair.

15 MAR 99 09 12

APPENDIX B
Air Force Form 813

INSTRUCTIONS: Section I to be completed by Proponent; Sections II and III to be completed by Environmental Planning Function. Continue on separate sheets as necessary. Reference appropriate item number(s).

SECTION I - PROPONENT INFORMATION

1. TO (Environmental Planning Function)	2. FROM (Proponent organization and functional address symbol)	2a. TELEPHONE NO.
99 ABW/EMP	99 CES/CECP	(702) 652-8451

3. TITLE OF PROPOSED ACTION

REPAIR AIRFIELD INFIELD - NELLIS AFB

4. PURPOSE AND NEED FOR ACTION (Identify decision to be made and need date)

1. Presently the areas adjacent the runways and taxiways are overgrown with trees and scrubs. These areas also have excessive slopes, numerous fixed and mobile obstacles, and deep erosion gullies throughout. (continued...)

5. DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES (DOPAA) (Provide sufficient details for evaluation of the total action.)

1. The area described above is approximately 800 acres. The proposed action is to grade these areas and apply a surface treatment to stabilize the soil. It includes clearing, rolling and applying a herbicide (continued...)

6. PROPONENT APPROVAL (Name and Grade)

STANLEY L. FUELLER, GS-12

6a. SIGNATURE



6b. DATE

4 May 99

SECTION II - PRELIMINARY ENVIRONMENTAL SURVEY. (Check appropriate box and describe potential environmental effects including cumulative effects.) (+ = positive effect; 0 = no effect; - = adverse effect; U = unknown effect)

+ 0 - U

7. AIR INSTALLATION COMPATIBLE USE ZONE/LAND USE (Noise, accident potential, encroachment, etc.)

8. AIR QUALITY (Emissions, attainment status, state implementation plan, etc.)

9. WATER RESOURCES (Quality, quantity, source, etc.)

10. SAFETY AND OCCUPATIONAL HEALTH (Asbestos/radioisotope/chemical exposure, explosives safety quantity-distance, etc.)

11. HAZARDOUS MATERIALS/WASTE (Use/storage/generation, solid waste, etc.)

12. BIOLOGICAL RESOURCES (Wetlands/woodlands, flora, fauna, etc.)

13. CULTURAL RESOURCES (Native American burial sites, archaeological, historical, etc.)

14. GEOLOGY AND SOILS (Topography, minerals, geothermal, land-use/land-cover, seismicity, etc.)

15. SOCIOECONOMIC (Employment/population projections, school and local fiscal impacts, etc.)

16. OTHER (Potential impacts not addressed above.)

SECTION III - ENVIRONMENTAL ANALYSIS DETERMINATION

17.	<input type="checkbox"/>	PROPOSED ACTION QUALIFIES FOR CATEGORICAL EXCLUSION (CATEX) # _____ ; OR
	<input type="checkbox"/>	PROPOSED ACTION DOES NOT QUALIFY FOR A CATEX; FURTHER ENVIRONMENTAL ANALYSIS IS REQUIRED.

18. REMARKS

19. ENVIRONMENTAL PLANNING FUNCTION CERTIFICATION (Name and Grade)

19a. SIGNATURE

19b. DATE

Block 4: (Continuation)

These features are hazardous to errant aircraft and threaten the safety of pilots that stray from normal travel paths.

2. The proposed action shall provide safety for both the pilot and aircraft. It will additionally provide other desired benefits. Poor drainage will be corrected to precluding ponding in the infield and flooding of the runways. Also, the BASH (Bird Air Strike Hazard) potential will also be significantly decreased with removal of the habitable environment.

Block 5: (Continuation)

Additionally a soil stabilizing agent ("Soil-Sement") shall be applied to reduce erosion and aircraft foreign object damage.

2. It is anticipated the proposed action will take place in as many as two to three equal phases depending on the affordability and funding availability.
3. Following are the alternatives to the proposed action:
 - (1) Do nothing
 - (2) Grading without stabilization
 - (3) Grading with application of "Polypavement"
 - (4) Grading with over-excavation and recompaction
 - (5) Grading with caliche fill and application of "Soil-Sement" soil treatment
 - (6) Grading with partial application of "Soil-Sement" soil treatment.

APPENDIX C

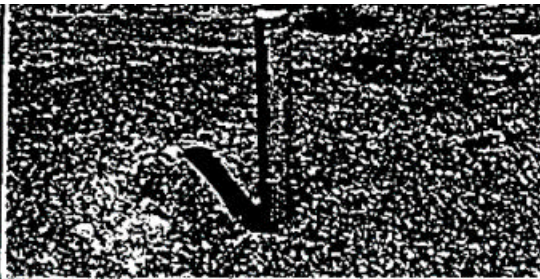
Photographs of Airfield Obstructions



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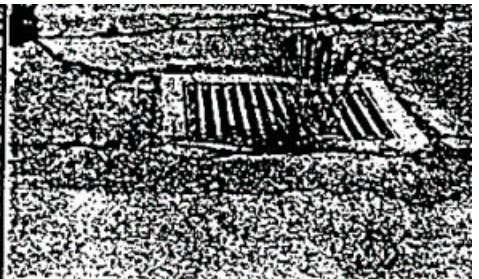
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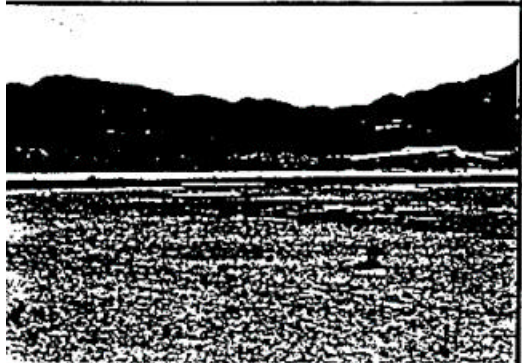
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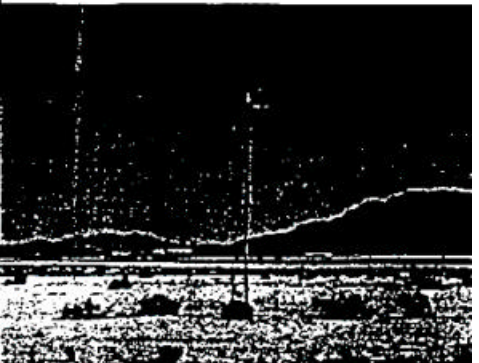
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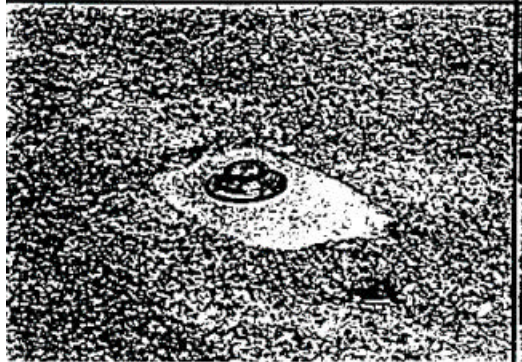
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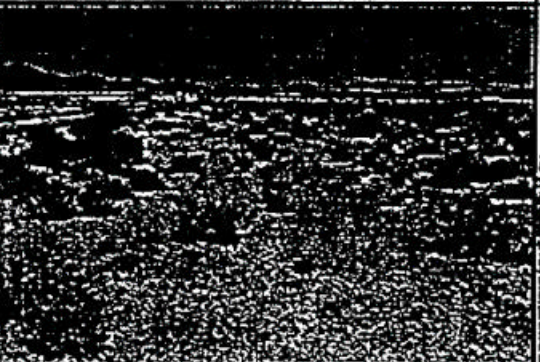
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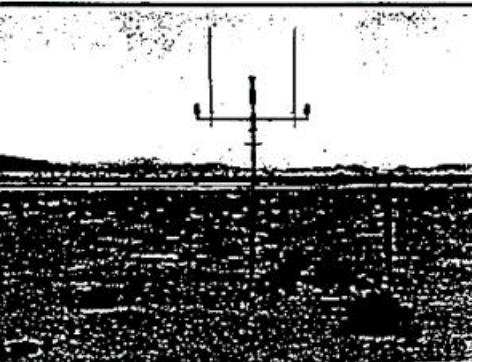
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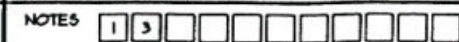
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| 21 | REMOVE COMMUNICATIONS PEDESTAL. |
| 22 | REMOVE TAXIWAY. |
| 23 | REMOVE ASPHALTIC CONCRETE PAVING. |
| 24 | REMOVE CONCRETE PAVING |
| 25 | REMOVE PIPE. |
| 26 | REMOVE RIPRAP. |



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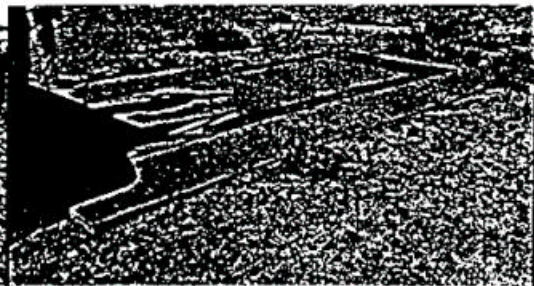
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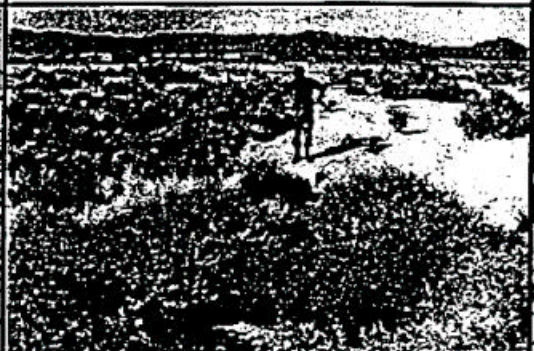
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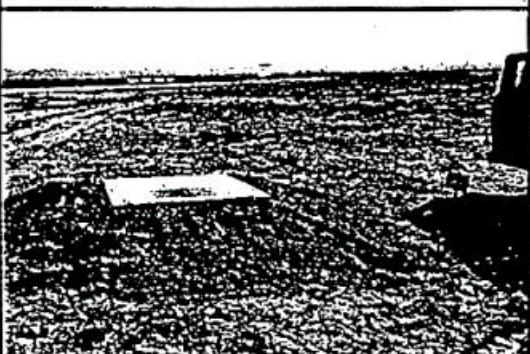
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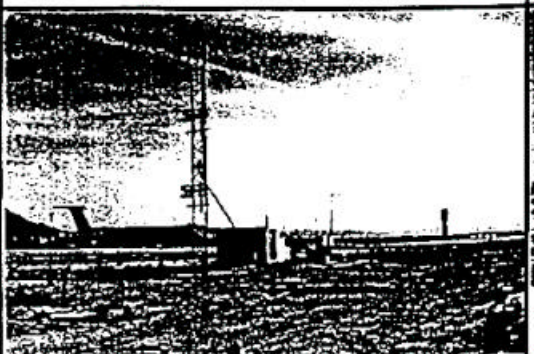
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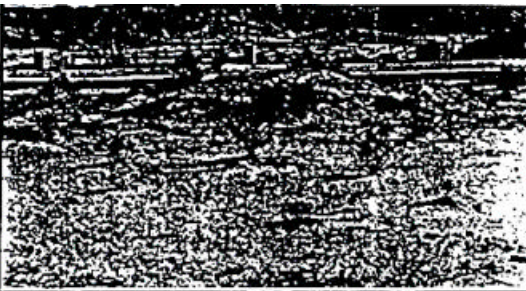
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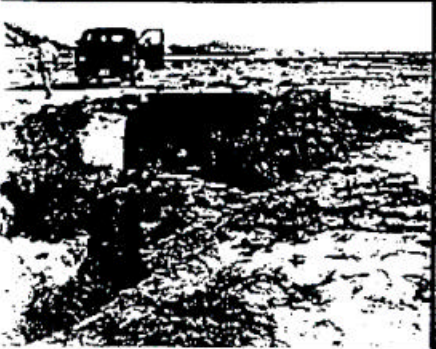
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GRAPHIC SCALES

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ASSOCIATES
ARCHITECTS ENGINEERS



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APPENDIX D

Operational Risk Management Assessment of Flight Operations at NAFB

OPERATIONAL RISK MANAGEMENT ASSESSMENT OF FLIGHT OPERATIONS AT NELLIS AIRFIELD

Prepared by

Lt Col Mike Winslow

**Headquarters Air Warfare Center Flight Safety Division
Nellis AFB, Nevada
DSN 682-2906**

7 October 1998

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NELLIS AFB BIRD STRIKE 5 YEAR HISTORY	5
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AFI 32-1013 COMPLIANCE ITEMS.....	8
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OPERATIONAL RISK MANAGEMENT ASSESSMENT OF FLIGHT OPERATIONS AT NELLIS AIRFIELD

INTRODUCTION: In recent years, the Nellis AFB airfield has sustained a significant increase in the vegetation in and around the runway environment. Additionally, the overall condition of the airfield is not in compliance with AFI 32-1013, which contains specific guidance on the structure and maintenance of the infields and non-prepared surfaces surrounding the runways and taxiways.

PURPOSE: The purpose of this paper is to identify and quantify the risks associated with flight operations at Nellis given the current condition of the airfield. It is hoped that by highlighting these risks, sufficient funding will be made available to bring the airfield in compliance with AFI 32-1013. This paper is divided into two sections. Section 1 provides background on the nature and scope of the problem and a summary of the actions taken over the past two years to remedy the situation. Section 2 is a risk analysis using ORM techniques to quantify the current risk level. Section 3 recommends control measures to reduce the risks created by the current state of the airfield.

SECTION 1: BACKGROUND

1. August 1996: The Chief of Airfield Management submitted a staff package (Appendix 1) that highlighted potential risks associated with excessive vegetation that had propagated on the Nellis AFB infield. Two risks identified in this package were an increased foreign object damage (FOD) potential due to blowing tumbleweeds, and a potential for an aircraft to collide with the wildlife (including birds) residing in and around the airfield during the takeoff / landing phase. The package contained a Base Civil Engineering Work Request (AF form 332) to accomplish the following actions:
 - a. Removal of airfield vegetation and grating and leveling of airfield ground surfaces.
 - b. Removal of all surface rocks greater than 5 inches in diameter.
 - c. Removal of abandoned features, such as old concrete pads and paved surfaces.
 - d. Covering exposed ground surface areas with a three-inch fill of caliche material, with heavy rolling of the top fill.
 - e. Spraying of pine resin emulsion over ground surfaces within 50 feet of taxiway and runway surfaces.
2. September 1996: The USAF Air Traffic System Evaluation Team conducted an evaluation of Nellis AFB. One of the findings of the evaluation team was that "extensive vegetation (bushes/small trees) in the infield areas create an ideal habitat for desert

wildlife and poses a significant threat to aircraft safety." The team further stated that "the execution of this work (cited in previous paragraph) will reduce the BASH wildlife hazard potential and provide the landscape required to minimize hazards to aircrew safety and damage to aircraft in the event of a mishap."

3. February 1998: The HQ AWFC Flight Safety Division conducted a quarterly Bird Hazard Working Group Meeting. One of the issues raised at this meeting was the bird strike hazard posed by excessive vegetation on the Nellis Airfield. The vegetation in and around the runway environment had become even more dense due to the abnormally high rainfall resulting from the El Nino weather pattern. One of the action items from this meeting was to determine the status of the package at Appendix I. Subsequent to this meeting, it was determined that no project number had been assigned to the civil engineering work order request referenced in paragraph 1(a). At the next quarterly Bird Hazard Working Group Meeting conducted on 5 June 1998, the excessive airfield vegetation was identified as an open action item. The airfield manager raised concerns that in addition to imposing a bird strike hazard, the state of the infield was such that it imposed a significant risk to aircraft should they depart the prepared surface. He also indicated that the airfield was not in compliance with AFI 32-1013, which contains specific instructions for the maintenance of the infield surrounding the runway environment. ✓

4. June 1998: AWFC Flight Safety elevated the issue to the 57 WG and 99 ABW senior leadership. This led to a meeting on 6 July 1998 attended by the 57th Airfield Manager, 99th ABW pavement and grounds shop, and the 99th ABW entomology shop. The purpose of this meeting was to identify and resolve the problems with the airfield. The E-mail at Appendix 2 details the results of this meeting. The key issues are summarized in the following paragraphs.

a. Historically, only the first 50 feet along the shoulders of the airfield had been maintained by the pavement and grounds section.

b. Maintaining the first 50 feet along the shoulders is not sufficient to ensure the airfield is in compliance with AFI 32-1013.

c. It was the judgement of the pavements and grounds representative that it would take his entire shop working full-time over one year to completely clear the airfield IAW AFI 32-1013.

d. A plan was developed to start clearing the airfield; however, it was noted in the meeting that additional 99 ABW resources or outsourcing would be required to bring the airfield in compliance with AFI 32-1013.

5. 15 and 18 July 1998: Clearing was conducted along the runway shoulders and infield. This project improved the situation; however, it did not bring the airfield in compliance with AFI 32-1013.

6. August 1998: The project at Appendix 1 was again submitted to the 99 ABW CE/CP for consideration. It was subsequently assigned a project number (98-0063) and submitted to ACC for funding. Because it was identified as a maintenance project, it was not eligible for funding under the current facility investment metric (FEM).

7. September 1998: The USAF Air Traffic System Evaluation Team conducted a Staff Assistance Visit at Nellis AFB. The entire airfield issue was again addressed with the team. Specifically, a request was made for a possible solution to obtaining funding to complete the project outlined in Appendix 1. The team recommended that an operational risk assessment be completed regarding the hazards associated with the current state of the airfield, and that this risk assessment be forwarded to ACC along with the request for funding. To increase the chances for funding, the team also recommended re-categorizing the project as a "repair" vice a "maintenance" project. HQ AWFC Flight Safety was tasked by the 57 WG OG/CC to conduct the operational risk assessment.

SECTION II: RISK ASSESSMENT

1. Methodology: The assessment was performed using the methodology in Air Force Pamphlet 91-215. First, the hazards associated with the airfield were identified. For each hazard, a probability of occurrence and the severity of the occurrence were assigned. Using the probability and severity, a risk (extremely high, medium, or low) was assigned using the matrix shown below.

Table 1. Risk Assessment Matrix

			PROBABILITY				
			Frequent	Likely	Occasional	Seldom	Unlikely
S E V E R I T Y	CATASTROPHIC	I	EXTREMELY HIGH				
	CRITICAL	II			HIGH		
	MODERATE	III		MEDIUM			
	NEGLIGIBLE	IV				LOW	
			RISK				

Assessments were made using historical data when available. If no historical data was available, a subjective judgement was made based on recent trends and incidents observed during operations. The following paragraphs identify the hazards associated with the current condition of the airfield, and quantify the risks associated with these hazards.

2. General: In considering the risks of conducting operations from Nellis AFB given the current condition of the airfield, it is important to note that Nellis is the busiest base in ACC. On a monthly basis, there are approximately 10,000 operations at the airfield. Red Flag operations include day and night missions consisting of large composite force packages. These packages include fighters, bombers, transport, tanker, and command and control aircraft. It is therefore important to consider the fact that operations are not limited to fighter sized aircraft. Of additional significance, many NATO countries routinely participate in Red Flag with both fighter and transport aircraft.

3. Hazard Identification: In it's current state, there are three hazards associated with the Nellis airfield.

- *Increased risk of bird strikes.*
- *Increased risk of foreign object damage to aircraft engines.*
- *Increased risk of aircraft damage and crew injury in the event an aircraft departs the runway surface.*

a. Hazard: Increased risk of bird strikes. The primary bird hazard to aircraft operating in the vicinity of the Nellis Airfield are Raptors (Hawks, Falcons, Kites, Eagles, and Vultures) and Owls. Raptors feed on rodents and small animals. Owls are nocturnal and are attracted to rodents as a food source. Currently, the large bushes and trees around the airfield provide an ideal habitat for rodents, and also provide perching sites for owls. Raptors are sighted on a daily basis around the airfield environment. The increased risk of bird strikes was highlighted by an incident that occurred at Nellis on 3 December 1997. A 57th Wing F-16 on a night mission ingested an owl into the intake during takeoff roll. Although the pilot was able to abort the takeoff, the aircraft sustained \$350,000 damage to the engine.

(1) Cause(s) Related To: Media.

(2) Effect of Hazard: Mission Degradation, Injury, Death, Equipment Damage.

(3) Probability of Strike: Occasional. In assessing the probability of strike, historical data was examined. Table 2 on the following page provides a five-year summary of bird strikes sustained by aircraft operating out of Nellis AFB, and the associated cost to repair the aircraft.

Table 2. Nellis AFB Bird Strike 5-Year History

<u>CALENDAR YEAR</u>	<u>NUMBER OF STRIKES</u>	<u>COST (Dollars)</u>
1994	9	1500
1995	3	16,858
1996	20	29,292
1997	23	0
1998	24	544299

In examining the bird strike data, it is difficult to completely quantify the probability of strike a strike occurring at or near the base due to the fact that the vast majority of the bird strike locations are reported as unknown. Clearly, the effect of El Nino on the desert environment has significantly increased the strike rate over the past three years. In FY 1997, there were no reported bird strikes during the taxi/takeoff/landing phase. In FY 1998 there were four reported incidents during these phases, shown in the table below:

Table 3. Nellis AFB Takeoff / Landing / Taxi Bird Strikes 1997-1998

<u>DATE</u>	<u>PHASE</u>	<u>TYPE/VC</u>	<u>STRIKE LOCATION</u>	<u>DAMAGE</u>	<u>COST</u>
3 December 1997	Takeoff	F-16	Inside Engine	Yes	349,657
21 June 1998	Taxi	A-10	#1 Engine	No	0
19 August 1998	Landing	A-10	Slat	No	0
4 September 1998	Landing	F-16	Stab	No	0

If one assumes that none of the remaining 20 FY 98 strikes occurred during the landing phase, then the rate for aircraft operating out of Nellis during the taxi/takeoff/landing phase is one strike every four months. This represents an occasional probability of a strike.

(4) Severity: Critical. The impact of a bird strike can range from Negligible to Catastrophic. In general, smaller birds represent a lesser hazard than the large Raptors found in the desert environment. The vegetation around and within the confines of the airfield provides an ideal habitat for large birds such as Raptors and Owls. As was demonstrated by the 3 December incident, an encounter with these types of birds can have severe consequences.

(5) Risk Level: High.

b. Hazard: Increased risk of foreign object (FOD) damage to aircraft. The ingestion of foreign objects into aircraft engines poses a serious hazard to safe flight operations. The scrub brush, and desert vegetation create problems in that objects are blown into the infield and become entangled in the trees/brush. Objects subsequently dislodged from the bushes end up on taxiways and runways. During high wind conditions, which are frequent at Nellis during the spring and fall months, tumbleweeds are blown across the runways and taxiways. The vegetation also prevents personnel conducting airfield inspections prior to the start of daily flight operations from spotting the FOD, as in many cases it is lodged in the plants. A recent incident that occurred on 17 August 1998 highlights these problems. The mishap sequence began with four 27 FW F-16s in the runway 03L end of runway (EOR) inspection area. While EOR crews were arming the F-16s, two B-1s taxied onto runways 03L and 03R for simultaneous departures. The B-1 on 03L experienced a fuel hot light while waiting for takeoff clearance, and attempted to correct the problem by running the engines in full afterburner approximately 200-300 feet from the end of the runway. Debris from the runway shoulders and infield was subsequently ingested into two of the four F-16s.

(1) Cause(s) Related To: Media.

(2) Effect of Hazard: Mission Degredation, Injury, Death, Equipment Damage.

(3) Probability of FOD Ingestion: Occasional. In assessing the probability of an aircraft ingesting FOD while operating on the Nellis Airfield, the best indicator is statistical data. The table below provides a three-year history of FOD ingestion at Nellis AFB.

Table 4. Nellis AFB FOD Incidents / Cost 1996-1998

Fiscal Year	Number of Occurrences	Cost (Dollars)
1996	3	3,712
1997	5	52,185
1998	6	29,884

This data clearly shows an increasing trend in FOD incidents over the past three years. It is likely that the increased vegetation in and around the runways and taxiways is contributing to this adverse trend.

(4) Severity: Critical. The impact of FOD ingestion can range from Moderate to Catastrophic.

(5) Risk Level: High.

b. Hazard: Increased risk of damage to aircraft / injury to aircrew in the event an aircraft departs the prepared surface. As previously stated, the Nellis airfield is not in compliance with AFI 32-1013. The provisions in this instruction ensure that the infield

and areas surrounding the taxiways are configured and maintained such that if an aircraft that departs the prepared surface, there is a high probability that it will come to rest in an upright attitude. The table below details the provisions in AFI 32-1013 that are currently not complied with at Nellis AFB.

Table 5. AFI 32-1013 Non-Compliance Items for Nellis AFB

PARAGRAPH	SUBJECT	STATEMENT
Table 2-2 #8	Runway Lateral Clearance	Distance is to be clear of fixed and mobile obstacles, including manmade or natural features such as trees, rocks, terrain irregularities and any other features constituting possible hazards to moving aircraft
Table 2-2, #9	Longitudinal grades within primary (1) surface	Slopes are to be gradual as practicable. Avoid abrupt changes or sudden reversals. Rough grade to the extent necessary to prevent damage to aircraft in the event of erratic performance.
Table 2-2, #10	Transverse grades within primary * surface	Same as above.
Table 2-3, #9	Taxiways	Rough grade to the extent necessary to prevent damage to aircraft in the event of erratic performance.
Table 2-7, 1-4	Clear Zones **	Area is to be cleared and grubbed of stumps and free of abrupt surface irregularities, ditches, and ponding areas. No aboveground structures, objects or traverse ways are permitted in the area. The maximum longitudinal grade change cannot exceed +/- 2.0 percent per 100 feet.
<p>* <u>Primary Surface</u>: A surface on the ground or water centered lengthwise on the runway and extending 200 feet beyond each end of that runway. The width of the primary surface is 2000 feet for a class B runway.</p> <p>** <u>Clear Zone</u>: A surface on the ground beginning at the runway end and symmetrical about the runway centerline extended. Dimensions are 3000 feet by 3000 feet.</p>		

(1) Cause(s) Related To: Media.

(2) Effect of Hazard: Mission Degredation, Injury, Death, Equipment Damage.

(3) Probability of an aircraft sustaining significant damage in the event of a departure from the prepared surface: Likely. This is a subjective analysis given

the current condition of the airfield. There are numerous bushes and shrubs along the runway perimeters beyond the first 50 feet. The primary landing runway at Nellis is runway 21. The vegetation around the overrun areas is fairly dense.

(4) Severity: Catastrophic. If an aircraft departs the prepared surface and impacts a tree, shrub, or bush, or encounters an erratic surface with gullies/severe grades, the aircraft will likely cartwheel. This would result in catastrophic damage to the aircraft and severe/fatal injuries to the aircrew.

(5) Risk Level: High. According to the Risk Level Matrix, the likelihood of an aircraft sustaining major damage should it depart the prepared surface coupled with a catastrophic severity rating places the risk level in the extremely high category. Before assigning a risk level to this hazard, however, it was necessary to consider the probability of an aircraft departing the prepared surface. The table below shows a 10-year history of departures from the prepared surface at Nellis AFB.

Table 6. Departures from the Prepared Surface at Nellis AFB 1987-1998

DATE	TYPE AIRCRAFT	PROBLEM
8 August 1987	F-15C	Not specified in data base
28 March 1988	F-4C	Hydraulic Failure
11 July 1989	OV-10	Blown tire on landing
12 July 1989	F-16	Blown tire on landing
18 February 1991	OV-10	Single Engine Landing
September 1998	B-1B	No Flap Landing

During this period, 6 aircraft departed the prepared surface. The B-1B occurrence in September 1998 was the result of a heavyweight landing in a no-flap configuration. The aircraft was brought to a complete stop approximately 200 feet into the runway 21R overrun, and the nose tires departed the runway as the pilot attempted to execute a 180 degree turn for back taxi. The two scenarios typically associated with aircraft departing the runway are blown tires and loss of brakes. Nellis is configured with two arrestment cables at each end of the runway. The first cable is 1000-1500 feet prior to the end of the runway. The second cable is at the juncture of the runway and overrun. Departure end arresting gear is used on a fairly regular basis at Nellis. In CY 1997 there were nine departure end arrestments. As of 2 October 1998, there have been four departure end arrestments in CY 1998. In all of these arrestments, the aircraft caught the first cable. Based on the occasional occurrence of departure from the prepared surface (less than one per year) coupled with reliability of the arresting gear, the overall risk of an aircraft sustaining damage as a result of the current condition of the airfield was downgraded from extremely high to high.

SECTION III: RISK CONTROL MEASURES

1. Assumptions: The proposed risk control measures are based on the following two assumptions:

- a. The fundamental goal is to bring the airfield in compliance with AFI 32-1013. This instruction was specifically written to ensure that the airfield environment minimizes the hazards addressed in Section II of this document.
- b. The ability to bring the airfield in complete compliance with AFI 32-1013 is beyond the scope of what is possible using 99 ABW resources. Outsourcing will be required.

2. Recommended Control Measures:

- a. Near Term: The bird strike hazard and FOD hazard are a function of the excessive vegetation on the airfield. These two hazards can be reduced through the continuation of clearing operations, which have already been implemented, to a limited extent. To facilitate these clearing operations, recommend that the 57 OSS provide the 99 ABW with a prioritized list of clearing zones. The clearing should be accomplished such that the airfield complies as closely as possible with the provisions in AFI 32-1013. Given the High risk level associated with the three hazards identified in this study, this work should be placed in a higher priority among the base projects, and be started immediately. Once the initial clearing is completed, a maintenance schedule should be devised and followed to ensure that the vegetation is kept under control.
- b. Long Term: A project to bring the airfield in compliance with AFI 32-1013 should be initiated. The nature and scope of this project should be similar to the proposal addressed in Appendix 1 of this report. Initial cost estimates for a project of this magnitude are on the order of two million dollars. By reducing the FY-98 FOD and bird strike damage by 50 percent, the project will have paid for itself in approximately 4 years.